

Patients were asked for their comments on the treatment they received. In the group receiving no treatment 15 of the 27 patients would have preferred some sort of support to the ankle and felt that their treatment was unsatisfactory. Despite their subjective comments they in fact had the shortest time off work. This may well reflect the less serious nature of the injury in this group as they had the best initial clinical score. All the patients who received physiotherapy were impressed by the treatment. They could all walk away from the department and thought the treatment greatly aided mobility and reduced pain and swelling. Patients who were given Tubigrip support had few comments, and only one patient would have preferred crutches. All patients who had had their ankle immobilised in plaster-of-Paris thought they had good pain relief but they were off work longer and had a longer attendance at the follow-up clinic. They complained of stiffness on removal of the plaster-of-Paris and found it more difficult to regain full mobility.

Discussion

The comparative efficiency of the different forms of treatment available in inversion injuries of the ankle is difficult to demonstrate. This is due to a combination of factors; difficulty in assessing the degree of injury or tear in the lateral ligament and the essential time-limited nature of the disability are among the most important.

These reasons also lead to poor patient co-operation in any trial to find the appropriate treatment. In our trial just over 100 patients either opted out of the trial or failed to attend for complete assessment. Previous reports indicate that patients returned to normal functional activities after an average of 13 days.¹ Our report indicates a return to work in an average of eight days. There have been series comparing the results of differing treatments²⁻³ but these were mainly concerned with

severe injury. The degree of talar tilt that is believed to indicate laxity of the ankle leading to instability is still controversial. In one series⁴ there was a sharp cut-off at 13° of talar tilt in normal ankles and in sprained ankles a similar cut-off was seen. Allowing for 1° or 2° accuracy this set our limit of talar tilt at 11° to 15°; we therefore took 15° as our abnormal limit.

It is estimated that there is about one inversion injury per 10 000 persons per day.⁵ Investigation and treatment can be expensive. While not all patients can be expected to be treated with physiotherapy, this study shows that mobilisation, with early physiotherapy or even without, offers the most rapid return to functional activity.

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Inversion injuries of the ankle: clinical assessment and radiographic review

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Abstract

Inversion injuries of the ankle are a common cause of referral and presentation to accident units. They impose a load on radiographic services. A prospective trial was carried out to determine the accuracy of clinical examination. All patients were assessed clinically then examined radiographically, the clinical assessment missed 5% of the fractures. These, however, were all minor avulsion fractures or crush fractures and Tubigrip support was sufficient.

Clinical examination is, therefore, accurate and the need for most x-ray examinations is questionable. X-ray examination should be reserved for patients with con-

tinuing pain or those who clinically have a fracture requiring immobilisation. This would produce a large saving in NHS resources.

Introduction

Inversion injuries of the ankle are among the commonest injuries presenting to accident and emergency departments. General practitioners refer patients to the department for x-ray examination to exclude injury to the bone. Radiographic examination of all these cases represents a considerable drain on limited resources: ankle radiographs account for about 2% of all radiological examinations. A prospective study was carried out to determine the accuracy of clinical examination of the ankle joint after inversion injury. Radiographic examination was made in every case, and stress views were taken to exclude increased laxity of the ankle joint. This was compared with the clinical assessment recorded before the x-ray film was taken or viewed by the clinical assessor.

Method

All patients with inversion injuries seen during a 10-week period at the regional accident unit in Edinburgh were included in the survey,

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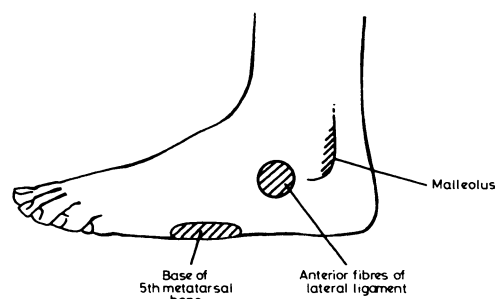
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except those aged under 12 years or over 65 years. Informed verbal consent was obtained from the patients included.

The patients were examined clinically and the assessor recorded the findings on a prepared assessment form. The assessment considered five factors—subjective pain, pain on stressing inversion, pain on plantar flexion, swelling, and bruising—and a score of 0 (none) to 3 (severe) was given for each factor. The site of maximal tenderness was considered to be important in indicating the nature of the injury, and tenderness was looked for in three specific areas (figure). An



Lateral view of ankle, indicating specific sites at which tenderness was sought.

assessment of bruising and swelling was made on a "None," "Mild," "Moderate," or "Severe" scale. A decision was then made as to whether or not there was a fracture or an appreciable degree of laxity. The assessors represented a wide range of clinical expertise, including senior house officers, registrars, and clinical assistants, who were general practitioners.

Anteroposterior and lateral radiographic views of the ankle were taken in every case and the films were reviewed within 24 hours by a radiologist. Patients were then seen again within 72 hours of the injury or presentation and a stress view of the ankle was taken under Entonox inhalation analgesia. This preparation gave adequate relaxation and analgesia, did not require technical expertise in the dose, and did not delay the patient's departure from the department. The stress views were also reviewed by a radiologist. A difference of 15° or greater in the degree of talar tilt between the injured and the uninjured side was accepted as indicating an appreciable degree of ligamentous laxity.

Results

Two hundred and forty-one patients with inversion injuries (137 men and 104 women) were included in the study. The age distribution is shown in table I, the increased incidence in the younger age group reflecting greater sporting activity. Of the 241 patients 205 (85%)

TABLE I—Age distribution of patients included in study

Age range (years)	12-19	20-29	30-39	40-49	50-59	60-65
No of patients	52	71	48	27	21	22

were diagnosed as having a partial tear of the lateral ligament, 30 (12.5%) as having a fracture of the lateral malleolus, and 6 (2.5%) as having an appreciable rupture of the lateral ligament with laxity. The prepared forms were then analysed comparing fractures with non-fractures. The degree of pain and swelling were similar in both groups (table II). The presence of bruising soon after the injury was more common in those with a fracture than in those with no fracture.

Comparing the diagnosis made by the assessor and the final diagnosis, we found that they concurred in 202 cases (84%) for fractures and in 222 (92%) for ligamentous laxity. This indicated an error in 38 (16%) cases. These included 12 (5%) false-negative diagnoses where a fracture was present but not diagnosed and 26 (11%) false-positive diagnoses where a fracture was diagnosed but x-ray examination showed no fracture.

An analysis of the false-negative cases showed that they consisted of: one case of fracture of the os calcis, which was clinically suspected

TABLE II—Comparison of symptoms and signs of patients with fractures and patients with no fracture

Clinical finding	No (%) of patients with fracture (n = 30)	No (%) of patients with no fracture (n = 211)
Moderate to severe subjective pain	21 (70)	139 (66)
Moderate to severe pain on stress inversion	22 (73)	124 (58)
Moderate to severe pain on plantar flexion	15 (50)	87 (41)
Moderate to severe swelling	20 (66)	110 (52)
Moderate to severe bruising	15 (50)	36 (17)
Any bruising at all present	24 (80)	87 (41)

but as the prepared form did not cater for this diagnosis it was recorded as a false-negative; careful clinical examination will avoid this not-unusual confusion; eight cases of fracture of the lateral malleolus, which were all hairline undisplaced fractures or flake fractures; and three cases of fracture of talus, which were all avulsion flake fractures of the anterior portion of the lateral ligament.

While it is accepted that fractures of the lateral malleolus are most appropriately treated by plaster-of-Paris immobilisation, no further displacement of these fractures occurred with the Tubigrip support applied. The avulsion fractures of the talus were all essentially due to excessive strain to the lateral ligament resulting in avulsion rather than rupture of the ligament. Their treatment as partial tear of the lateral ligament was appropriate, and the patients were not penalised by the false diagnosis.

In detection of ligamentous laxity the assessors concurred with the radiographic diagnosis in 231 cases (95.8%). An analysis of the error rate showed that there were nine false-positive findings where an appreciable degree of laxity was diagnosed by the assessor but no laxity was shown according to our criteria. There was only one false-negative finding where the diagnosis of laxity was not detected clinically; this patient was treated by immobilisation in plaster-of-Paris.

Discussion

Ankle radiographs account for about 2% of all radiographs taken in a general hospital and about 10% of those taken in an accident unit.¹ In 1960 Garfield² examined 111 patients and found several groups where radiography were not indicated. A subsequent retrospective study¹ confirmed Goldberg's³ view that much of this represents unnecessary radiography. Our prospective study shows that clinical examination of the ankle after inversion injury is highly accurate provided a detailed history of the precise mechanism of injury has been taken and a careful examination looking for tenderness at specified sites is carried out. Localised tenderness over the anterior fibres of the lateral ligament indicates a partial tear and, in the absence of severe tenderness over the lateral malleolus, may be treated as a simple sprain. X-ray examination in such cases contributes nothing to their management.

We propose that initial careful clinical assessment of inversion injuries followed by x-ray examination only in those cases where clinically a fracture is highly likely or where there are continuing symptoms would reduce the radiographic work load. Repeated throughout the country, this would contribute appreciably to conserving resources for accident units.

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